

**REMARKS**

Claims 1-10 and 12-29 are currently pending in the subject application, and are presently under consideration. Claims 1-18, 20-24, 28, and 29 stand rejected. Claims 19 and 25-27 are objected to as being dependent from a rejected base claim. Claims 6, 10, 12, 22 and 27 have been amended. Claim 11 has been cancelled. Favorable reconsideration of the application is requested in view of the amendments and comments herein.

**I. Specification**

The specification has been objected to because the Serial Number and filing information have been omitted from the paragraph under “Related Application.” Accordingly, this informality has been corrected. Withdrawal of this objection is respectfully requested.

The specification has also been objected to because the Abstract contains less than fifty words. Accordingly, this informality has been corrected. Withdrawal of this objection is respectfully requested.

**II. Claim Objections**

Claim 5 has been objected to for the informality that “at at” should be changed to “at.” Representative for Applicant respectfully disagrees with this objection. The second “at” is the preposition for the prepositional phrase “at least three of.” The second “at” is separate and distinct from the first “at,” which is the preposition for the object of where the measurements are implemented. Withdrawal of this objection is respectfully requested.

Claim 27 has been objected to for the informality that “parmeters” should be changed to “parameters.” Accordingly, claim 27 has been amended to correct this informality. Withdrawal of this objection is respectfully requested.

**III. Rejection of Claims 1-5, 7-17, 20-22, 28, and 29 Under 35 U.S.C. §102(e).**

Claims 1-5, 7-17, 20-22, 28, and 29 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,594,604 to Metzger, et al. (“Metzger”). Claims 10 and 12 have been amended. Claim 11 has been cancelled. Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 1 recites that the S-parameter calculator computes the S-parameters based on single port measurements implemented at each of plural ports of the network. The Office

Action dated March 16, 2005 (at page 4), asserts that Metzger teaches single port measurements implemented at each of plural ports of the network in the Abstract, lines 5-6. The cited section of Metzger states that the system measures incident and reflected waveforms at all of the network's ports (Abstract, ll. 4-6). However, neither this cited section, nor any other part of Metzger, states that the measurements of the system of Metzger are single port measurements implemented at each of plural ports of a network, as recited in claim 1. In contrast to claim 1, the figures of Metzger that demonstrate waveform measurement of a network (FIGS. 5-7 and 16) all clearly illustrate that the network is interconnected between two directional couplers, one connected to each of the two ports. The directional couplers each link either a signal source or a load impedance to each of the two ports, and the S-parameters for the network are determined by forward and reverse testing (see, *e.g.*, Metzger, col. 3, ll. 14-29; col. 7, ll. 58-67; and col. 8, ll. 1-17). Forward and reverse testing, as taught by Metzger, are not single port measurements, as recited in claim 1, but are instead measurements of S-parameters while both of the ports of the DUT are connected to the directional couplers. That is, Metzger teaches the use of multi-port (not single port) measurements to determine S-parameters of a network. Accordingly, Metzger does not anticipate claim 1 because it does not teach each and every element of claim 1. Withdrawal of the rejection of claim 1, as well as claims 2-9 which depend from claim 1, is respectfully requested.

Claim 3 recites that the S-parameter calculator determines reflection coefficients based on waveform parameters, and that the S-parameter calculator determines the S-parameters based on the reflection coefficients. The Office Action dated March 16, 2005 (at page 4), asserts that Metzger teaches determining S-parameters based on reflection coefficients at column 2, lines 27-35. The cited section, however, teaches two equations that demonstrate the relationship between waveform parameters and the S-parameters. Metzger, therefore, does not teach a S-parameter calculator that determines the S-parameters based on the reflection coefficients, as recited in claim 3. Additionally, the Office Action dated March 16, 2005 (at page 4), further asserts that Metzger teaches determining reflection coefficients based on waveform parameters at column 2, lines 22-26. However, this cited section refers to the S-parameter  $S_{22}$  as an "output reflection coefficient." This characterization of an S-parameter as a reflection coefficient is inconsistent with the recitations of claim 3 in that it does not make sense to determine the S-parameters based on an S-parameter, as is being suggested by the Office Action dated March 16, 2005. The rejection of claim 3 is, therefore,

internally inconsistent in view of the teachings of Metzger upon which the rejection is based. Accordingly, Metzger does not anticipate claim 3. Withdrawal of the rejection of claim 3, as well as claim 4 which depends from claim 3, is respectfully requested.

Claim 5 recites that the network is a two-port network and that the single port measurements comprise measurements implemented at at least three of the first port while the second port is open, the first port while the second port is shorted, the second port while the first port is open, and the second port while the first port is shorted. The Office Action dated March 16, 2005 (at pages 4-5), asserts that Metzger teaches claim 5 at FIGS. 9, 10, 12, and 13. Representative for Applicant respectfully disagrees with this assertion. Metzger teaches that FIGS. 8-15 depict test setups for calibration of a data acquisition and processing (DAP) system, such as a network analyzer (Metzger, col. 3, line 53 through col. 4, line 5). In contrast to the assertion in the Office Action, Metzger, however, does not teach that the procedure for calibration of a DAP system is or would be implemented on a network. The short circuits and open circuits are test setups that are performed on the directional couplers of the DAP system to determine and calibrate the E-parameters associated with the DAP system (Metzger, col. 4, ll. 5-12). The directional couplers are the interfaces to which a network is attached when determining the network's S-parameters (see, *e.g.*, Metzger, FIG. 5). Therefore, Metzger does not teach that the single port measurements comprise measurements implemented at at least three of the first port while the second port is open, the first port while the second port is shorted, the second port while the first port is open, and the second port while the first port is shorted, as recited in claim 5. Accordingly, Metzger does not anticipate claim 5. Withdrawal of the rejection of claim 5 is respectfully requested.

Claim 7 recites that the S-parameter calculator computes the S-parameters of the network based on a subset of less than all possible reflection coefficients for the network. The Office Action dated March 16, 2005 (at page 5), asserts that Metzger teaches claim 7 by the measurement at one port P1. Representative for Applicant respectfully disagrees with the characterization of Metzger. Specifically, when applying a frequency source to the port P1, Metzger teaches that the waveform parameters  $a_1$  and  $b_1$  is obtained at the port P1, and that the waveform parameter  $b_2$  is obtained from the port P2 during multi-port and not single port measurements. The waveform parameter eliminated from the equation is parameter  $a_2$  (corresponding to an incident waveform) because there is no incident wave at the port P2 due to a balanced load of impedance  $Z_0$  at P2. From this set of measurements at both ports P1 and P2, two of four S-parameters ( $S_{11}$  and  $S_{21}$ ) can be calculated (Metzger, col. 2, ll. 50-63).

Metzger further teaches that measurements are made while applying a frequency source to the port P2 to determine another set of waveform parameters; namely parameters  $a_2$  and  $b_2$  are obtained at port P2 and only the waveform parameter  $b_1$  is obtained from the port P1. The other waveform parameter  $b_2$  is eliminated because there is no incident wave at the port P1 due to a balanced load of impedance  $Z_0$  at P2. From this second set of multi-port measurements, the other two S-parameters ( $S_{12}$  and  $S_{22}$ ) can be calculated (Metzger, col. 2, line 64 through col. 3, line 6).

Metzger thus teaches that, to obtain the full set of S-parameters for a DUT, two separate multi-port measurements are made. The measurements of Metzger are not single port measurements, as recited in claim 1 from which claim 7 depends. Moreover, the parameters  $a_2$  and  $b_2$ , which are eliminated from the equations, are not reflection coefficients, but instead correspond to incident waveforms at a port to which a balanced load has been applied. Additionally, because Metzger teaches that a full set of S-parameters is obtained through the two multi-port measurements, and that each of the multi-port measurements results in the calculation of one of the two reflection coefficients taught by Metzger ( $S_{11}$  and  $S_{22}$ ), the S-parameters of the network, as taught by Metzger, are computed from all possible reflection coefficients. Further to this, as discussed above regarding claim 3, the term "reflection coefficients" as used in Metzger actually refer to the S-parameters, and it, therefore, does not make sense to compute S-parameters of a network based on a subset of less than all possible S-parameters. For these reasons, Metzger therefore does not anticipate claim 7. Withdrawal of the rejection of claim 7 is respectfully requested.

Claim 10 has been amended to include the elements from cancelled claim 11. Specifically, amended claim 10 recites that a reflection coefficient engine provides a subset of at least  $n-1$  reflection coefficients associated with ports of the multi-port network based on single port measurements performed at each of the ports of the  $n$ -port network. As described above regarding claim 1, Metzger does not teach single port measurements performed at each of the ports of a network. Therefore, Metzger does not anticipate amended claim 10. Withdrawal of the rejection of claim 10, as well as claims 12 and 13 which depend from claim 10, is respectfully requested.

Claim 12 has been amended to change dependency. For at least the reasons discussed above regarding claim 5, Metzger does not anticipate claim 12. Withdrawal of the rejection of claim 12 is respectfully requested.

For at least the reasons described above regarding claim 7, Metzger does not anticipate claim 13. Withdrawal of the rejection of claim 13 is respectfully requested.

Since Metzger does not teach computing S-parameters based on single port measurements, as discussed above regarding claim 1, Metzger does not anticipate claim 14. Withdrawal of the rejection of claim 14, as well as claims 15-18 which depend from claim 14, is respectfully requested.

Claim 22 has been amended to correct a typographical error. Since Metzger does not teach computing S-parameters based on single port measurements, as discussed above regarding claim 1, Metzger does not anticipate claim 20. Withdrawal of the rejection of claim 20, as well as claims 21-26 which depend from claim 20, is respectfully requested.

For at least the reasons described above regarding claim 3, Metzger does not anticipate claim 21. Withdrawal of the rejection of claim 21 is respectfully requested.

Since Metzger does not teach computing S-parameters based on single port measurements, as discussed above regarding claim 1, Metzger does not anticipate claim 28. Withdrawal of the rejection of claim 28 is respectfully requested.

Claim 29 recites determining reflection coefficients based on single port measurements performed at plural ports of the network and determining S-parameters of the network based on reflection coefficients. For at least the reasons described above regarding claims 1 and 3, Metzger does not anticipate claim 29. Withdrawal of the rejection of claim 29 is respectfully requested.

#### **IV. Rejection of Claims 6, 18, 23, and 24 Under 35 U.S.C. §103(a)**

Claims 6, 18, 23, and 24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Metzger in view of U.S. Patent No. 5,548,538 to Grace, et al. ("Grace"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claims 6 and 24 depend, respectively, from claims 1 and 20. As described above, Metzger does not teach or suggest single port measurements implemented at each of plural ports of a network, as recited in claims 1 and 20. The addition of Grace does not cure the deficiencies of Metzger to teach or suggest single port measurements implemented at each of plural ports of a network, as recited in claims 1 and 20, and as such, claims 1 and 20 are patentable over the cited art. Accordingly, dependent claims 6 and 24 are also patentable.

In addition, claims 6 and 24 recite determining reflection coefficients comprising at least three of a first reflection coefficient of a first port while each of the other plural ports is

open, a second reflection coefficient of the first port while each of the other plural ports is shorted, a third reflection coefficient of a second port while each of the other plural ports is open, and a fourth reflection coefficient of the second port while each of the other plural ports is shorted. The Office Action dated March 16, 2005 (at page 7), asserts that it “would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide Metzger with reflection coefficients under different loading as disclosed by Grace for the purpose of determining error terms composed of particular S-parameters.” Representative for Applicant respectfully disagrees with this assertion. The Office Action dated March 16, 2005, relies on Grace to teach the elements of claims 6 and 24, specifically stating that “Grace discloses measuring S-parameters with the reflection coefficients of short, open, and load for the purpose of calibrating the network by determining error terms composed of particular S-parameters.” (Office Action dated March 16, 2005, citing Grace, col. 1, ll. 33-39). Grace teaches that a vector network analyzer (VNA) can be calibrated “by measuring the scattering matrix of an unknown ‘thru’ as a DUT plus reflection coefficients of a short, open, and load to determine error terms composed of particular S-parameters of two error boxes  $E_A$  and  $E_B$  between the ports of the VNA and a two port reflectometer of the VNA as shown in FIG. 1.” (Grace, col. 1, ll. 33-39). Grace thus teaches that reflection coefficients are obtained to determine error terms of error boxes composed of particular S-parameters to calibrate a VNA. Grace, however, does not teach that the reflection coefficients are used to determine S-parameters for a network, as recited in the independent claims from which claims 6 and 24 depend. For example, if the ports of the VNA are connected in the manner taught by Grace, (*i.e.*, the DUT is not connected at either of Port A or Port B), measurements for the S-parameters of the DUT cannot be measured.

Moreover, the obtained reflection coefficients of an “open” and a “short”, as taught by Grace, are in place of obtaining the S-parameters of a DUT, such that the DUT is removed from the VNA and replaced by either an open circuit or a short circuit at the two ports (Grace, FIG. 1, Port A and Port B) to which the DUT was previously attached. Therefore, the open and the short connection, as taught by Grace, corresponds to the connection of one of the two ports of the VNA relative to the other, such that the two ports are either shorted together or open relative to each other. Accordingly, Grace does not teach or suggest that a reflection coefficient of a first port is determined *while each of the other plural ports* is open or shorted, as recited in claims 6 and 24 (emphasis added). In claims 6 and 24, the reflection coefficients for a given port are not determined by shorting that port to the other of the plural

ports, as suggested by the Examiner in relying on the teachings of Grace. In FIGS. 2 and 3 of the Present Application, for example, element 26 represents an electrical coupling means, and is “used to short the terminals of the output port P2.” (Present Application, page 10, ll. 17-23). Thus, it is the terminals of one port of the network that are shorted together, and not the two separate ports of the VNA being shorted together as taught by Grace. Additionally, if the two ports on a network were shorted together, adequate measurements of the waveform parameters for the given port could not be obtained as the two ports would form a single node, and thus could not result in a measurement of waveform parameters for a given one port.

For the reasons stated above, neither Metzger nor Grace, individually or in combination, teach or suggest claims 6 and 24. Withdrawal of the rejection of claims 6 and 24 is respectfully requested.

Claim 18, which depends from claim 14, recites that the computing means comprises means for determining plural sets of the S-parameters for the network based on different respective sets of the reflection coefficients. The Office Action dated March 16, 2005 (at page 6) rejects claim 18 in view of Metzger over Grace, but fails to provide any factual basis or technical reasoning to support the conclusion that claim 18 is obvious to one of ordinary skill in the art. The list of claim elements in the Office Action as not being taught by Metzger, but are asserted to be taught by Grace, are not recited in claim 18. It appears that the list of elements may have been taken from either claim 6 or 24, and that the reasons for rejecting these claims were erroneously applied to claim 18. Since, no factual basis has been asserted that would support the rejection of claim 18, it is respectfully submitted that the Examiner has not established a prima facie case of obviousness in the rejection of claim 18. Neither Metzger nor Grace, individually or in combination, teach or suggest a computing means that comprises means for determining plural sets of the S-parameters for the network based on different respective sets of the reflection coefficients, as recited in claim 18. Accordingly, allowance of claim 18 is respectfully requested.

For at least similar reasons to those discussed above regarding claims 6 and 24, claim 23 should also be patentable over the cited art. Withdrawal of the rejection of claim 23 is respectfully requested.

**V. Allowable Subject Matter**

Applicants appreciate the indication of allowable subject matter with respect to claims 19 and 25-27. However, claims 19 and 27 depend from claim 14, and claims 25 and 26 depend from claim 20. For the reasons discussed above, claims 14 and 20 should be patentable over the cited art. Therefore, withdrawal of the objection to claims 19 and 25-27 is respectfully requested.

**VI. CONCLUSION**

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests reconsideration of this application and that the application be passed to issue.

Should the Examiner have any questions concerning this paper, the Examiner is invited and encouraged to contact Applicant's undersigned attorney at (216) 621-2234, Ext. 106.

No additional fees should be due for this response. In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 08-2025.

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